

## **Patent Abstracts of Japan**

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APPLICANT: SEIKO EPSON CORP;

INVENTOR:

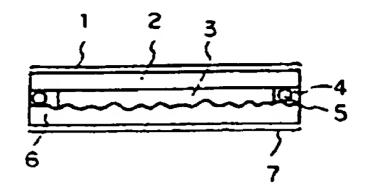
KUROIWA MASAHIRO;

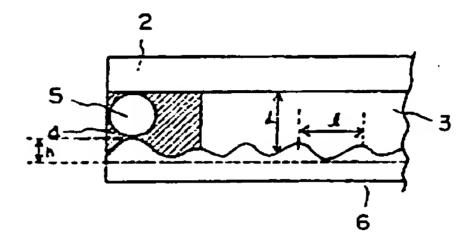
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TITLE

: LIQUID CRYSTAL SHUTTER





ABSTRACT: PURPOSE: To obtain a uniform contrast in a wide visual angle range by forming the surface of an electrode substrate on the side in contact with a liquid crystal layer to a rugged shape.

> CONSTITUTION: The surface of the lower electrode substrate 6 of the upper electrode substrate 2 and the lower electrode substrate 6 of a liquid crystal cell on the side in contact with the liquid crystal layer 3 is provided with ruggedness by etching using hydrofluoric acid, etc., and an ITO film is formed thereon. The film is subjected to an orientation treatment. The height h is 0 to 5 µm and the spacings I of the ruggedness array irregularly at 10 to 500 $\mu m$ . The product  $\Delta n.d$  of the refractive index anisotropy  $\Delta n$  and cell thickness d of the liquid crystal, therefore, varies at the fine pitch of l=10 to 500µm and, therefore, the colors by the respective An.d are subtracted and the coloring of the panel is substantially invisible. The liquid crystal shutter having the uniform contrast within the wide visual angle range is eventually obtd.

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